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मानक

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IS/QC 300201 (2000): Fixed capacitors for use in electronic equipment, Part 15: Blank detail specification : Fixed tantalum capacitors with solid electrolyte and porous anode assessment level E [LITD 5: Semiconductor and Other Electronic Components and Devices]



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“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

इलैक्ट्रॉनी उपकरणों में प्रयुक्त जड़ित संघारित्र

भाग 15 ब्लैंक डिटेल विशिष्टि:

ठोस विद्युत-अपघट्य और सरंध्र एनोड सहित जड़ित टैंटलम संघारित्र
मूल्यांकन स्तर ई

Indian Standard

**FIXED CAPACITORS FOR USE IN ELECTRONIC
EQUIPMENT**

PART 15 BLANK DETAIL SPECIFICATION:

**FIXED TANTALUM CAPACITORS WITH SOLID ELECTROLYTE AND POROUS ANODE
ASSESSMENT LEVEL E**

ICS 31.060.40

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BUREAU OF INDIAN STANDARDS
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NATIONAL FOREWORD

This Indian Standard which is identical with IEC 384-15-3/IEC QC 300201 (1984) 'Fixed capacitors for use in electronic equipment — Part 15: Blank detail specification: Fixed tantalum capacitors with solid electrolyte and porous anode — Assessment level E' [along with Amendment No. 1 (1992)] issued by the International Electrotechnical Commission (IEC), was adopted by the Bureau of Indian Standards on the recommendation of Resistors and Capacitors for Electronic Equipment Sectional Committee and approval of the Electronics and Telecommunication Division Council.

The text of the IEC standard has been approved as suitable for publication as Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.
- b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

Amendment No.1 (1992) to the above International Standard has been printed at the end.

Only the English language text in the International Standard has been retained while adopting it in this standard.

This standard is intended primarily for use under IECQ system.

CROSS REFERENCES

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated:

<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
IEC 384-1(1982) Fixed capacitors for use in electronic equipment — Part 1: Generic specification	IS QC 300000: 1988/IEC QC 300000 (1982) Fixed capacitors for use in electronic equipment, Generic specification	Identical
IEC 384-15 (1982) Part 15: Sectional specification: Fixed tantalum capacitors with non-solid or solid electrolyte	IS QC 300200: 2000/IEC QC 300200 (1982) Part 15 Sectional specification: Fixed tantalum capacitors with non-solid or solid electrolyte	do
IEC 410 (1973) Sampling plans and procedures for inspection by attributes	IS 10673:1983 Sampling plans and procedures for inspection by attributes for electronic items	Not equivalent

Indian Standard
**FIXED CAPACITORS FOR USE IN ELECTRONIC
EQUIPMENT**

PART 15 BLANK DETAIL SPECIFICATION:

**FIXED TANTALUM CAPACITORS WITH SOLID ELECTROLYTE AND POROUS ANODE
ASSESSMENT LEVEL E**

INTRODUCTION

Blank detail specification

A blank detail specification is a supplementary document to the Sectional Specification and contains requirements for style and layout and minimum content of detail specifications. Detail specifications not complying with these requirements may not be considered as being in accordance with I E C specifications nor shall they so be described.

In the preparation of detail specifications the content of Sub-clause 1.4 of the sectional specification shall be taken into account.

The numbers between brackets on the first page correspond to the following information which shall be inserted in the position indicated.

Identification of the detail specification

- [1] The "International Electrotechnical Commission" or the National Standards Organization under whose authority the detail specification is drafted.
- [2] The I E C or National Standards number of the detail specification, date of issue and any further information required by the national system.
- [3] The number and issue number of the I E C or national Generic Specification.
- [4] The I E C number of the blank detail specification.

Identification of the capacitor

- [5] A short description of the type of capacitor.
- [6] Information on typical construction (when applicable).
Note. — When the capacitor is not designed for use in printed board applications, this shall be clearly stated in the detail specification in this position.
- [7] Outline drawing with main dimensions which are of importance for interchangeability and/or reference to the national or international documents for outlines. Alternatively, this drawing may be given in an appendix to the detail specification.
- [8] Application or group of applications covered and/or assessment level.
Note. — The assessment level(s) to be used in a detail specification shall be selected from the sectional specification, Sub-clause 3.5.4. This implies that one blank detail specification may be used in combination with several assessment levels, provided the grouping of the tests does not change.
- [9] Reference data on the most important properties, to allow comparison between the various capacitor types.

[1]	I E C 384-15-3-XXX QC 300201-XXX [2]
ELECTRONIC COMPONENTS OF ASSESSED QUALITY IN ACCORDANCE WITH: [3]	I E C 384-15-3 QC 300201 [4]
	FIXED TANTALUM CAPACITORS WITH SOLID ELECTROLYTE AND POROUS ANODE WITH LEAD OR TAG TERMINATIONS (Sub-family 3) [5]
Outline drawing: (see Table I) (... angle projection) [7] (Other shapes are permitted within the dimensions given)	Typical construction: [6]
	Assessment level(s): E [8] Performance grade:

Information on the availability of components qualified to this detail specification is given in the Qualified Products List.

[9]

SECTION ONE — GENERAL DATA

1. General data

1.1 Recommended method(s) of mounting (to be inserted)

(See Sub-clause 1.4.2 of I E C Publication 384-15)

1.2 Dimensions

TABLE I

Case size reference	Dimensions (in millimetres or inches and millimetres)					
	Ø	L	H	d		

Notes 1. — When there is no case size reference, Table I may be omitted and the dimensions shall be given in Table IIA, which then becomes Table I.

2. — The dimensions shall be given as maximum dimensions or as nominal dimensions with a tolerance.

3. — Other presentations of the above information may be necessary, but the above presentation should be followed as much as possible.

1.3 Ratings and characteristics

Capacitance range (see Table IIA)

Tolerance on rated capacitance

Rated voltage (see Table IIA)

Category voltage (if applicable) (see Table IIA)

Climatic category

Rated temperature

Variation of capacitance with temperature (see Table IIB)

Tangent of loss angle (see Table IIB)

Leakage current (see Table IIB)

Impedance (if applicable) (see Table IIC)

Reverse voltage (if required)

TABLE IIA

Values of capacitance and of voltage related to case sizes

Rated voltage				
Category voltage *				
Rated capacitance (in μF)	Case size	Case size	Case size	Case size

* If different from the rated voltage.

TABLE IIB
Characteristics at high and low temperature

U_R (V)	C_R (μ F)	Capacitance change (%)			Maximum values					
					Tan δ (%)			Leakage current (μ A)		
		θ_A	θ_R	θ_B	$\theta_A^{2)}$	20 °C	$\theta_B^{2)}$	20 °C	θ_R	$\theta_B^{1)}$

θ_A = Lower category temperature

θ_B = Upper category temperature

θ_R = Rated temperature

¹⁾ Measured with category voltage

²⁾ If applicable

TABLE IIC
Impedance at . . . kHz (if applicable)

Case size	Impedance (Ω)
1	
2	
3	
4	

1.4 *Related documents*

Generic specification: I E C Publication 384-1 (1982): Fixed Capacitors for Use in Electronic Equipment. Part 1: Generic Specification.

Sectional specification: I E C Publication 384-15 (1982): Part 15: Sectional Specification: Fixed Tantalum Capacitors with Non-solid or Solid Electrolyte.

1.5 *Marking*

The marking of the capacitor and the packing shall be in accordance with the requirements of I E C Publication 384-15, Sub-clause 1.6.

Note. — The details of the marking of the component and packing shall be given in full in the detail specification.

1.6 *Ordering information*

Orders for capacitors covered by this specification shall contain, in clear or in coded form, the following minimum information:

- a) Rated capacitance.
- b) Tolerance on rated capacitance.
- c) Rated d.c. voltage.
- d) Number and issue reference of the detail specification and style reference.

1.7 *Certified records of released lots*

Required/not required.

1.8 *Additional information (not for inspection purposes)*

1.9 *Additional or increased severities or requirements to those specified in the generic and/or sectional specification*

Note. — Additions or increased requirements should be specified only when essential.

TABLE III

Other characteristics

This table is to be used for defining characteristics which are additional to or more severe than those given in the sectional specification.

SECTION TWO — INSPECTION REQUIREMENTS

2. Inspection requirements

2.1 Procedures

2.1.1 For Qualification Approval, the procedures shall be in accordance with the Sectional Specification, IEC Publication 384-15, Sub-clause 3.4.

2.1.2 For Quality Conformance Inspection, the test schedule (Table IV) includes sampling, periodicity, severities and requirements. The formation of inspection lots is covered by Sub-clause 3.5.1 of the Sectional Specification.

TABLE IV

Notes 1. — Sub-clause numbers of tests and performance requirements refer to the Sectional Specification, IEC Publication 384-15 and Section One of this specification.

2. — Inspection Levels and AQL's are selected from IEC Publication 410: Sampling Plans and Procedures for Inspection by Attributes.

3. — In this table:

- p = periodicity (in months)
- n = sample size
- c = acceptance criterion (permitted number of defectives)
- D = destructive
- ND = non-destructive
- IL = inspection level
- AQL = acceptable quality level } IEC Publication 410

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	I L (see Note 2)	A Q L	Performance requirements (see Note 1)
Group A inspection (lot-by-lot)					
<i>Sub-group A1</i>	ND		S-4	2.5%	
4.1 Visual examination					As in 4.1
4.1 Dimensions (gauging)					Legible marking and as specified in 1.5 of this specification
					As specified in Table I of this specification
<i>Sub-group A2</i>	ND		II	1.0%	
4.2.1 Leakage current		Protective resistance: ... Ω			$\leq \dots \mu\text{A}$, see Table IIB
4.2.2 Capacitance		Frequency: ... Hz			Within specified tolerance
4.2.3 Tangent of loss angle		Frequency: ... Hz			$\leq \dots$, see Table IIB
4.2.4 Impedance (if applicable)		Frequency: ... Hz			$\leq \dots \Omega$, see Table IIC

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	I L (see Note 2)	A Q L	Performance requirements (see Note 1)
Group B inspection (lot-by-lot) <i>Sub-group B1</i> 4.5 Solderability	D	Without ageing Method: ...	S-3	2.5%	Good tinning as evidenced by free flowing of the solder with wetting of the terminations or solder shall flow within ... s, as applicable
<i>Sub-group B2</i> 4.15 Characteristics at high and low temperature (if required)	ND	The capacitors shall be measured at each temperature step <i>Step 1: 20 °C</i> Leakage current Capacitance Tangent of loss angle <i>Step 2: Lower category temperature</i> Capacitance Tangent of loss angle * <i>Step 3: Rated temperature</i> Leakage current Capacitance Tangent of loss angle * <i>Step 4: Upper category temperature</i> Leakage current Capacitance Tangent of loss angle *	S-3	2.5%	} For use as reference value $\frac{\Delta C}{C} \leq \dots \% **$ $\leq \dots **$ $\leq \dots \mu A **$ $\frac{\Delta C}{C} \leq \dots \% **$ $\leq \dots **$ $\leq \dots \mu A **$ $\frac{\Delta C}{C} \leq \dots \% **$ $\leq \dots **$

* If applicable.
** See Table IIB.

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of accept- ability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
Group C inspection (periodic)						
<i>Sub-group C1A</i> Part of sample of Sub-group C1	D		6	9	1	
4.3.1 Initial measurement		Capacitance				
4.3 Robustness of terminations		Visual examination				No visible damage
4.4 Resistance to soldering heat		Method: ...				
4.4.2 Final measurements		Visual examination				No visible damage Legible marking
<i>Sub-group C1B</i> Other part of sample of Sub-group C1	D		6	18	1	
4.6.1 Initial measurement		Capacitance				
4.6 Rapid change of temperature		θ_A = Lower category temperature θ_B = Upper category temperature Five cycles Duration $t = 30$ min Recovery: 16 h				
4.6.3 Final measurements		Leakage current				$\leq \dots \mu A$, see Table IIB $\frac{\Delta C}{C} \leq \dots \%$ of value measured in 4.6.1
		Capacitance				
		Tangent of loss angle				$\leq \dots$, see Table IIB
4.7 Vibration		Method of mounting: see 1.1 of this specification Procedure B4 Frequency range: ... Hz to ... Hz Amplitude: ... mm or acceleration: ... m/s ² whichever is the less severe Duration: ... h				
4.7.2 Final inspection		Visual examination				No visible damage
4.8 Bump (or shock, see 4.9)		Method of mounting: see 1.1 of this specification Number of bumps: ... acceleration: 390 m/s ² Duration of pulse: 6 ms				
4.9 Shock (or bump, see 4.8)		Method of mounting: see 1.1 of this specification Acceleration: ... m/s ² Duration of pulse: ... ms				
4.8.2 or 4.9.2 Final measurement		Visual examination				No visible damage

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of accept- ability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
<i>Sub-group C1</i> Combined sample of specimens of Sub- groups C1A and C1B 4.10 Climatic sequence 4.10.1 Initial measurement 4.10.2 Dry heat 4.10.3 Damp heat, cyclic, Test Db, first cycle 4.10.4 Cold 4.10.5 Low air pressure (if required by the detail specification) 4.10.5.3 Intermediate measurement 4.10.6 Damp heat, cyclic, Test Db, remaining cycles 4.10.7 Sealing (if required by the detail specification) 4.10.8 Final measurements	D	Capacitance Temperature: upper category temperature Duration: 16 h Visual examination Temperature: lower category temperature Duration: 2 h Visual examination Air pressure: 8.5 kPa (85 mbar) Visual examination Method: ... Visual examination Leakage current Capacitance Tangent of loss angle	6	27	1	No visible damage No visible damage No breakdown, flash- over or harmful defor- mation of the case According to the method selected No visible damage Legible marking $\leq$ initial limit $\frac{\Delta C}{C}$ for: <i>Long-life grade:</i> $\leq 5\%$ of value measured in 4.10.1 and $\leq 8\%$ of value measured in 4.3.1 or 4.6.1 as applicable <i>General-purpose grade:</i> $\leq 12\%$ of value measured in 4.10.1 $\leq$ initial limit

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of accept- ability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
<i>Sub-group C2</i> 4.11 Damp heat, steady state 4.11.1 Initial measurement 4.11.2 Final measurements	D	Capacitance Visual examination Leakage current Capacitance Tangent of loss angle Insulation resistance of the external insulation (if applicable) Voltage proof of the external insulation (if applicable)	6	9	1	No visible damage Legible marking $\leq$ initial limit $\frac{\Delta C}{C}$ for: <i>Long-life grade:</i> $\leq 5\%$ of value measured in 4.11.1 <i>General-purpose grade:</i> $\leq 12\%$ of value measured in 4.11.1 $\leq$ initial limit $\geq 100 \text{ M}\Omega$ No breakdown or flashover
<i>Sub-group C3</i> 4.12 Endurance 4.12.1 Initial measurement 4.12.3 Final measurements	D	Duration: ... h Ambient temperature: ... °C (as applicable) Applied voltage: ... V Recovery: 16 h Capacitance Visual examination Leakage current Capacitance Tangent of loss angle	3	24	1	No visible damage Legible marking ≤ 1.25 times initial limit $\frac{\Delta C}{C} \leq 10\%$ of value measured in 4.12.1 $\leq$ initial limit

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of accept- ability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
<i>Sub-group C4A</i> 4.13 Surge 4.13.1 Initial measurement 4.13.3 Final measurements	D	Number of cycles: 1 000 Temperature: ... °C Protective resistor: 1 000 Ω ± 10% Duration of charge: 30 s Duration of discharge: 5 min 30 s Capacitance Leakage current Capacitance Tangent of loss angle	12	6	1	$\leq$ initial limit $\frac{\Delta C}{C} \leq 10\%$ of value measured in 4.13.1 $\leq$ initial limit
<i>Sub-group C4B</i> 4.14 Reverse voltage (if required) 4.14.1 Initial measurement 4.14.3 Final measurements	D	Upper category temperature with a voltage of ... V, in reverse po- larity direction during 125 h, followed by 125 h at upper cat- egory temperature with category voltage in forward polarity direction Capacitance Leakage current Capacitance Tangent of loss angle	12	6	1 1	$\leq$ initial limit $\frac{\Delta C}{C} \leq 10\%$ of value measured in 4.14.1 ≤ 1.15 times initial limit

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	Sample size and criterion of accept- ability (see Note 3)			Performance requirements (see Note 1)
			p	n	c	
<i>Sub-group C5</i>	D		6	15	1	
4.15 Characteristics at high and low temperature ***		The capacitors shall be measured at each temperature step <i>Step 1: 20 °C</i> Leakage current Capacitance Tangent of loss angle <i>Step 2: Lower category temperature</i> Capacitance Tangent of loss angle * <i>Step 3: Rated temperature</i> Leakage current Capacitance Tangent of loss angle * <i>Step 4: Upper category temperature</i> Leakage current Capacitance Tangent of loss angle *				} For use as reference value $\frac{\Delta C}{C} \leq \dots \% **$ $\leq \dots **$ $\leq \dots \mu A **$ $\frac{\Delta C}{C} \leq \dots \% **$ $\leq \dots **$ $\leq \dots \mu A **$ $\frac{\Delta C}{C} \leq \dots \% **$ $\leq \dots **$
4.16 Charge and discharge (if required)		Temperature: 20 °C Number of cycles: 10⁶ Duration of charge: 0.5 s Charge resistor: ... Ω Duration of discharge: 0.5 s Discharge resistor: ... Ω				
4.16.1 Initial measurement		Capacitance				No visible damage
4.16.3 Final measurements		Visual examination Capacitance Tangent of loss angle				$\frac{\Delta C}{C} \leq 5\%$ of value measured in 4.16.1 $\leq$ initial limit

* If applicable.

** See Table IIB.

*** Not applicable if test is made in Group B2.

AMENDMENT NO. 1

Page 6

Table IV Group A inspection.

Add a new Sub-group A0 above the existing Sub-group A1 with the following columns:

Sub-clause number and Test (see Note 1)	D or ND	Conditions of test (see Note 1)	I L	A Q L	Performance requirements (see Note 1)
<u>Sub-group A0</u> 4.19 High surge current (if required by the detail specification)	ND		(see Note 2)		
				100 %	

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